EX 22 PAGE33

$$z^4=1\Leftrightarrow z=e^{i\frac{2k\pi}{4}}=e^{i\frac{k\pi}{2}}\quad k\in\{0,1,2,3\}\quad S_{\mathbb{C}}=\left\{e^{i0},e^{i\frac{\pi}{2}},e^{i\pi},e^{i\frac{3\pi}{2}}\right\}=\{1,i,-1,-i\}$$

$$\left(\frac{z-i}{z+i}\right)^4=1\Leftrightarrow\frac{z-i}{z+i}=e^{i\frac{k\pi}{2}}\quad k\in\{0,1,2,3\}\quad d'après\quad a)$$

$*\ \frac{z-i}{z+i}=1$ *impossible* $\qquad *\frac{z-i}{z+i}=i\Leftrightarrow z-i=iz-1\Leftrightarrow z(1-i)=-1+i\Leftrightarrow z=-1$

$*\frac{z-i}{z+i}=-1\Leftrightarrow z-i=-z-i\Leftrightarrow z=0\quad *\frac{z-i}{z+i}=-i\Leftrightarrow z-i=-iz+1\Leftrightarrow z(1+i)=1+i\Leftrightarrow z=1$

$$S_{\mathbb{C}}=\{-1,0,1\}$$

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$$z^3=4\sqrt{2}(-1+i)=8e^{i\frac{3\pi}{4}}\Leftrightarrow z=2e^{i\frac{\pi}{4}+\frac{2k\pi}{3}}\quad avec\ k\in\{0,1,2\}$$

1.
$$S_{\mathbb{C}}=\left\{2\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right);2\left(\cos\frac{11\pi}{12}+i\sin\frac{11\pi}{12}\right);2\left(\cos\frac{19\pi}{12}+i\sin\frac{19\pi}{12}\right)\right\}$$

2.

Les racines cubiques de l'unité sont : $1,\ j=-\frac{1}{2}+i\frac{\sqrt{3}}{2}$ *et* $j^2=-\frac{1}{2}-i\frac{\sqrt{3}}{2}$

$\sqrt{2}+i\sqrt{2}$ *é tan t une racine cubique de* $4\sqrt{2}(-1+i)\Rightarrow$ *Les racines cubiques de* $4\sqrt{2}(-1+i)$ *sont* :

$$\sqrt{2}+i\sqrt{2};\left(\sqrt{2}+i\sqrt{2}\right).j=\frac{-\sqrt{2}-\sqrt{6}}{2}+i\frac{-\sqrt{2}+\sqrt{6}}{2}\ et\ \left(\sqrt{2}+i\sqrt{2}\right).j^2=\frac{-\sqrt{2}+\sqrt{6}}{2}+i\frac{-\sqrt{2}-\sqrt{6}}{2}$$

3.

$$\left(\sqrt{2}+i\sqrt{2}\right).j=\frac{-\sqrt{2}-\sqrt{6}}{2}+i\frac{-\sqrt{2}+\sqrt{6}}{2}=2e^{i\frac{\pi}{4}}.e^{i\frac{2\pi}{3}}=2e^{i\frac{11\pi}{12}}$$

$$\cos\frac{11\pi}{12}=\frac{-\sqrt{2}-\sqrt{6}}{4}\Rightarrow\cos\frac{\pi}{12}=\frac{\sqrt{2}+\sqrt{6}}{4}\ et\ \sin\frac{11\pi}{12}=\frac{-\sqrt{2}+\sqrt{6}}{4}\Rightarrow\sin\frac{\pi}{12}=\frac{-\sqrt{2}+\sqrt{6}}{4}$$

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